

REMARKS

Claims 1-25 are pending in this application. Claims 10-17 have been withdrawn from consideration. Claim 1 has been amended solely for clarifying the claim language without the intention of narrowing the scope of this claim.

Claim Rejections – 35 U.S.C. § 112

Claims 2 and 3 have been rejected under 35 U.S.C. § 112, second paragraph.

Claim 2 recites, *inter-alia*, “wherein the first temperature control device controls the temperature of the slot electrode to be in a predetermined temperature range so as to substantially eliminate influence of water released from components in the process chamber on a substrate being processed.” One of ordinary skill in the art would understand that the temperature of the slot electrode is maintained within a temperature range so that the water that may be released from components in the process chamber does not influence the substrate being processed. Therefore, the Applicant respectfully submits that the pending claims are in full compliance with 35 U.S.C. § 112.

Claim Rejections – 35 U.S.C. § 102

Claims 1, 2, and 4-7 have been rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Ishii *et al.* (U.S. Pat. No. 5,698,036). The Applicant respectfully traverses this rejection for at least the following reasons.

The Examiner contends that Ishii *et al.* discloses (referring to Figures 14-19, col. 11, line 46 through col. 12, line 67, and col. 14, line 60 through col. 15, line 13) a microwave plasma processing apparatus comprising the elements recited in claim 1 and in particular cooling fins 84 (first temperature control device), cooling fans, or cooling jacket may be used to cool the flat antenna member 44, dielectric material 80, and dielectric accommodating portion 82a. In response to arguments filed August 16, 2002, the Examiner contends the cooling jacket of Ishii *et al.* controls the temperature of the flat antenna member 44 (slot electrode) and the dielectric material 80 (wavelength reducing member) in a predetermined range of temperature. The Applicant respectfully disagrees.

The cooling fins 84, cooling fans or cooling jacket in Ishii *et al.* are merely used to cool the flat antenna member 44 and the dielectric material 80 by heat discharge to atmosphere (see, col. 11 lines 54-60 and col. 12, lines 17-26 of Ishii *et al.*). The cooling fins 84, cooling fans or the cooling jacket of Ishii *et al.* do not provide controlling the temperature

Amendment

of the slot electrode and component parts including the wavelength reducing member in a predetermined range of temperatures. Specifically, in order to control the temperature of, for example, the slot electrode, within a predetermined temperature range, one would need to maintain the temperature between a lower limit temperature and a higher limit temperature. Ishii *et al.* merely teaches cooling fins, cooling fans or a cooling jacket for cooling the flat antenna, i.e. Ishii *et al.* merely teaches lowering the temperature below a certain temperature such as a melting point of the flat antenna (corresponding to a higher temperature limit). Ishii *et al.*, however, fails to teach, disclose or suggest a lower temperature limit above which the flat antenna should be maintained. Maintaining the temperature above a lower temperature limit allows, for example, eliminating influence of water on a substrate during processing (see, for example, page 4 of the specification).

Consequently, Ishii *et al.* does not disclose or suggest controlling the temperature of the slot electrode and component parts including the wavelength reducing member in a predetermined range of temperatures.

Therefore, the Applicant respectfully submits that claim 1, and claims 2, 4-7 which depend from claim 1, are patentable and respectfully requests that the rejection of claims 1, 2, and 4-7 under § 102(b) be withdrawn.

Claim Rejections – 35 U.S.C. § 103

Claim 3 has been rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Ishii *et al.* The Applicant respectfully traverses this rejection for at least the following reasons.

In response to arguments filed August 16, 2002, the Examiner admits that Ishii *et al.* does not recite the temperature range. The Examiner, however, contends that it is not inventive to discover the optimum range or workable ranges (between 60°C and 80°C). The Applicant respectfully disagrees.

Claim 3 is indirectly dependent from patentable claim 1. Therefore, the Applicant respectfully submits that claim 3 is patentable for at least the reason that it contains all the limitations of claim 1. Moreover, the Applicant submits that discovering the temperature range (between 60°C and 80°C) is not obvious because as stated throughout the specification (for example, in page 14, line 8 through page 15, line 20), controlling the temperature in a temperature range allows controlling the plasma density in the process chamber in order to

Amendment

achieve a high quality plasma processing. Consequently, Ishii *et al.* does not disclose, teach or suggest the subject matter recited in claim 3.

Therefore, the Applicant respectfully submits that claim 3 is patentable and respectfully requests that the § 103(a) rejection of claim 3 be withdrawn.

Claim 8 has been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ishii *et al.* in view of Yamazaki (Japanese Patent Publication 10-060657). The Applicant respectfully traverses this rejection for at least the following reasons.

Claim 8 is indirectly dependent from patentable claim 1. Therefore, the Applicant respectfully submits that claim 8 is patentable for at least the reason that it contains all the limitations of claim 1.

The Examiner concedes that Ishii *et al.* fails to teach a third temperature control device controlling a temperature of the periphery of the dielectric material member.

In response to arguments filed August 16, 2002, the Examiner states that the third temperature control device of Yamazaki '657 is the nozzle that supplies the cooling gas to the periphery of the dielectric substance window. The Examiner, however, did not specify which element in Yamazaki's device corresponds to the nozzle that supplies the cooling gas. Moreover, as stated in the response filed on August 16, 2002, the cooling gas, in Yamazaki '657, is introduced through a section in plate 31 onto the top of dielectric substance window 30 and not on the periphery of the dielectric substance window 30. In fact, the periphery of the dielectric material member 30 of Yamazaki '657 is surrounded by the walls of reaction vessel 22 (see, figure 1 in Yamazaki '657). Consequently, neither Ishii *et al.* nor Yamazaki '657 disclose, teach or suggest, alone or in combination, a controlling device controlling a temperature of a periphery of the dielectric material member. Therefore, the Applicant respectfully submits that claim 8 is patentable and respectfully requests that the § 103(a) rejection of claim 8 be withdrawn.

Claim 9 has been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ishii *et al.* in view of Yamazaki (Japanese Patent Publication 01-036985). The Applicant respectfully traverses this rejection for at least the following reasons.

Claim 9 is dependent from patentable claim 1. Therefore, the Applicant respectfully submits that claim 9 is patentable for at least the reason that it contains all the limitations of claim 1.

Amendment

Moreover, the Examiner concedes that Ishii *et al.* fails to show the temperature control arrangement for controlling the temperature of the side wall. In addition, one of ordinary skill in the art would not be motivated to use the heater 110 and the cooling pipe 111 arrangement shown in Yamazaki '985 in the apparatus of Ishii *et al.* because Ishii *et al.* does not disclose, teach or suggest heating or cooling the sidewalls of the processing container 4. Therefore, the Applicant respectfully submits that claim 9 is patentable and respectfully requests that the § 103(a) rejection of claim 9 be withdrawn.

Claims 18-20 and 22 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ishii *et al.* in view of Fujimoto *et al.* (Japanese Patent Publication 01-072526). The Applicant respectfully traverses this rejection for at least the following reasons.

Claims 18-20 and 22 are dependent directly or indirectly from patentable claim 1. Therefore, the Applicant respectfully submits that claims 18-20 and 22 are patentable for at least the reason that they contain all the limitations of claim 1.

Moreover, the Examiner concedes that Ishii *et al.* fails to teach a control unit, a temperature sensor, and a heater. The Examiner contends that Fujimoto *et al.* teaches a microwave plasma processor with an electrode 8 (slot electrode) connected to a temperature control means (control unit). The temperature control means includes a heater 12, heater power source 9 and a thermometer 13 and the heater power source controls a current flowing through heater 12 based on detected temperature and thus it would have been obvious to provide the slot electrode and wavelength reducing member of Ishii *et al.* with a control unit, temperature sensor and heater as taught by Fujimoto *et al.*. The Applicant respectfully disagrees.

The microwave plasma processing apparatus, recited in claim 18, comprises, *inter alia*, a slot electrode guiding the microwave exiting the wavelength reducing member, the slot electrode provided adjacent to the wavelength reducing member.

In contrast, Fujimoto *et al.* teaches a microwave plasma processor having a grounding electrode 8 surrounding a substrate electrode 7 (see Figures 1 and 2 of Fujimoto *et al.*). The grounding electrode 8 is a pipe and has a coils shape (see Abstract and Figure 2 of Fujimoto *et al.*) Consequently, the electrode 8 of Fujimoto *et al.* is not a slot electrode. Thus, Fujimoto *et al.* teaches away from using a slot electrode. Accordingly, Fujimoto *et al.* and Ishii *et al.* cannot be combined.

Amendment

Therefore, the Applicant respectfully submits that claim 18 and claims 19, 20 and 22 which are dependent therefrom, are patentable and respectfully requests that the § 103(a) rejection of claims 18-20 and 22 be withdrawn.

Claims 21 and 23-25 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ishii *et al.* in view of Fujimoto *et al.* (Japanese Patent Publication 01-072526) and further in view of Orezyk *et al.* (US Pat. No. 5,937,323) and Shirasago *et al.* (Japanese Patent Publication 02-197575). The Applicant respectfully traverses this rejection for at least the following reasons.

Claims 21 and 23-25 are dependent directly or indirectly from patentable claim 1. Therefore, the Applicant respectfully submits that claims 21 and 23-25 are patentable for at least the reason that they contain all the limitations of claim 1.

Moreover, the Examiner concedes that Ishii *et al.* in view of Fujimoto *et al.* fails to teach a temperature control plate and fluid controller. The Examiner contends that Orezyk *et al.* teaches a control plate including a cold plate 24 and a heater plate 23 (heating wire). The cold plate 24 and the heater plate 23 are provided on the dome 14 (dielectric) and thus it would have been obvious to one of ordinary skill in the art to provide the slot electrode of Ishii *et al.* with the temperature control plate of Orezyk *et al.* The Applicant respectfully disagrees.

Claim 21 recites, *inter-alia*, “the heater comprises a heating wire wound on a fluid supply tube connected to a fluid passage in a temperature control plate to supply a fluid to the temperature control plate.” In contrast, Orezyk *et al.* is completely silent about providing a heating wire wound on a fluid supply tube to supply a fluid to the temperature control plate.

Similarly, Shirasago *et al.* is silent about providing a heating wire wound on a fluid supply tube to supply a fluid to the temperature control plate. Shirasago *et al.* merely shows a pipe 1102 wound in spiral conformation inside hollow electrode 110 (electrode 110 has a cylindrical shape, see the Figures in Shirasago *et al.*) The electrode 110 in Shirasago *et al.* is not a plate. Consequently, Ishii *et al.*, Fujimoto *et al.*, Orezyk *et al.* and Shirasago *et al.* do not disclose, teach or suggest, alone or in combination the subject matter recited in claim 21.

Therefore, the Applicant respectfully submits that claims 21 and 23-25 are patentable and respectfully requests that the § 103(a) rejection of claims 21 and 23-25 be withdrawn.

CONCLUSION

In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned at the telephone number listed below.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached Appendix is captioned "Version with markings to show changes made".

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,

Pillsbury Winthrop LLP

By: 

Glenn J. Perry

Reg. No.: 28,458

Tel. No.: (703) 905-2161

Fax No.: (703) 905-2500

GJP/KXG
1600 Tysons Boulevard
McLean, VA 22102
(703) 905-2000
Enclosure: Appendix

APPENDIX

version with markings to show changes made

IN THE CLAIMS

Claim 1 has been amended as follows:

1. (Twice Amended) A microwave plasma processing apparatus comprising:
 - a wavelength reducing member constructed and arranged to reduce a wavelength of a microwave transmitted therethrough;
 - a slot electrode guiding the microwave exiting the wavelength reducing member, the slot electrode provided adjacent to the wavelength reducing member;
 - a first temperature control device constructed and arranged to control a temperature of at least one of the slot electrode and component parts including the wavelength reducing member provided in the vicinity of the slot electrode within a predetermined range of temperatures by heating at least one of the slot electrode and component parts including the wavelength reducing member above a lower temperature limit and cooling at least one of the slot electrode and component parts including the wavelength reducing member below a higher temperature limit; and
 - a process chamber into which the microwave exiting the slot electrode is introduced so that a plasma is generated by the microwave within the process chamber.

End of Appendix